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IOWA 84 HAMILTON

POWER COST STUDY

245. UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration. *Power Division*
50 Washington 25, D. C.

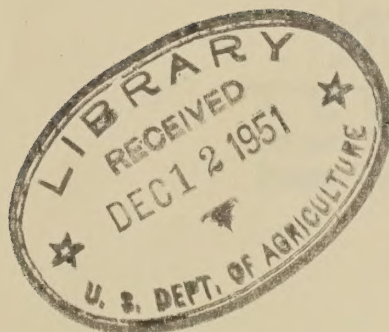
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August 13, 1951

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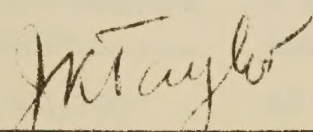
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IOWA 84 HAMILTONSYSTEM POWER ANALYSIS

This study determines the cost of power assuming funds in the amount of \$587,000 are loaned the Corn Belt Power Cooperative (Iowa 84 Hamilton) for the construction of additional substations, transmission line taps, air break switches, and an extension to the step-up substation at the Sherwood plant for interconnection with the Glidden Electric Cooperative (Iowa 5 Carroll).

The main purpose of the loan request is to provide funds for purchasing the additional substations in advance of the completion of a more extensive engineering study and allotment report now being prepared. It is proposed that the additional substations will be purchased by amendment to the existing contract between Corn Belt and the Evans Construction Company. This company is now doing work in connection with the substations for the "C" loan and according to a statement in the Engineering Report it has agreed to add these additional substations at the same unit price quoted in the existing contract provided that this amendment is approved before August 23, 1951, after which time its prices are no longer firm with the suppliers. It is also expected that considerable savings will be effected if the cooperative is provided funds now to enable it to amend existing contracts for the construction in connection with the additional air break switches and the extension to the Sherwood substation. The transmission line construction proposed in this loan consists of approximately 26 miles 69 kv line needed in order to energize five of the additional substations from Corn Belt's facilities. Two of the additional substations are needed as spares.

Cost of power to serve the allocated load of 195,934,768 kwh is estimated to average 1.16 cents per kwh delivered to the distribution substations. The system firm generating capacity of 53,105 kw is considered adequate to supply the estimated allocated demand of 53,800 kw.



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IOWA 84 HAMILTON

POWER COST STUDY

CONCLUSIONS

Loan funds in the amount of \$587,000 are required by Corn Belt for seven additional substations, eight switching stations, and an extension to the substation at the Sherwood plant. Also included in the request of \$587,000 are funds to construct 26 miles of transmission line taps necessary in order to energize two of the additional substation from Corn Belt's existing system. This request is made in advance of a more extensive system study and loan request now being prepared. By making funds available now the cooperative will be able to accomplish the above construction by amendments to existing contracts at the same firm prices quoted in those contracts and thereby effect considerable savings in construction costs.

Cost of power to serve the allocated load of 195,934,768 kwh is estimated to average 1.16 cents per kwh delivered to the distribution substations. The system firm generating capacity of 53,105 kw is considered adequate to serve the allocated demand (exclusive of Iowa 5 Carroll) of 53,800 kw.

LOAD DATA

The load data shown in this study were obtained from the A & L Division by memorandum dated August 8, 1951. It is expected that this study will be followed by a more extensive power cost study in the next few months when the Stanley Engineering Company completes its pre-loan engineering report, and the cooperative has submitted a new loan request based on that more extensive study. For this reason, only allocated load data are shown in this study. A summary of these data follows:

	<u>Number of Members</u>	<u>KWH @ Members Meters</u>	<u>% Line Loss</u>	<u>KWH @ SS</u>
Iowa 14 Humboldt	1,855	9,844,200	20	12,305,250
Iowa 27 Buena Vista	3,024	15,827,860	20	19,701,040
Iowa 30 Franklin	2,065	9,708,060	20	12,135,075
Iowa 31 Grundy	2,430	14,618,062	18	17,826,904
Iowa 32 Butler	4,497	20,827,128	17	25,092,925
Iowa 33 Calhoun	1,869	9,115,380	20	11,394,225
Iowa 36 Wright	2,251	10,613,200	20	13,266,500
Iowa 38 Pocahontas	3,087	16,131,336	18	20,164,170
Iowa 41 Hancock	2,073	7,821,360	18	9,538,240
Iowa 49 Hardin	2,822	13,169,700	25	17,559,600
Iowa 60 Emmet-Dickinson	2,814	11,564,208	18	14,102,690
Iowa 67 Sac	1,120	7,614,780	16	9,065,214
Total - Iowa 84 Hamilton	29,907	146,855,274	19.4	182,151,833
Iowa 5 Carroll	1,639	10,125,616	15	12,470,700
Iowa 18 Wright	169	1,115,400	15	1,312,235
Total	31,715	158,096,290	19.1	195,934,768

WHOLESALE POWER SITUATION

Corn Belt generates the major portion of its requirements, however, it does purchase some power from the following suppliers in the quantities and at the rates indicated below for the year June 1950 through May 1951.

<u>Supplier</u>	<u>Delivery Point</u>	<u>KW Maximum Billing Demand</u>	<u>Energy Purchased</u>	<u>Average Cost ¢/kwh</u>
Iowa Public Service Co.	Waterloo	202	679,200	1.44
Iowa Public Service Co.	Stcrn Lake	2970	4,107,000	1.38
Iowa Electric L & P Co.	Nevada	2040	3,009,600	1.06
Alta Municipal	Alta	750	848,700	1.31
Sumner Municipal	Sumner	392	533,040	1.73
Estherville Municipal	Estherville	2400	10,194,600	1.43
Interstate Power Co.	Estherville	<u>714</u>	<u>2,589,600</u>	1.19
		9468	21,961,740	

As soon as steam generating capacity now under construction is completed, it is expected that the cooperative will discontinue purchasing power from the above suppliers, however, it is expected that all or most of these interconnections will be maintained for standby and possibly for the sale by the cooperative of off-peak power.

In regard to the availability of Bureau of Reclamation power, the Senate and House Committees reduced the appropriation for the Bureau to some extent and specifically eliminated funds for the construction of transmission lines in Iowa. Elimination of the transmission lines in Iowa leaves the cooperative without any assurance as to the availability of Bureau power.

PROPOSED ADDITIONS

Based on distribution system studies which have been completed for several of the member cooperatives, seven additional substations and about 26 miles of 69 kv transmission line extensions are required, as follows:

<u>Substation Location</u>	<u>Member Cooperative</u>	<u>KVA Rating</u>	<u>Miles of 69 kv line</u>
Fostoria	Iowa 27 Buena Vista	1000	-
Boone Valley	Iowa 36 Wright	1000	9
Denhart	Iowa 41 Hancock	1000	-
Sac City	Iowa 67 Sac	1500	17
Schaller	Iowa 67 Sac	1000	-
2 spare substations	-	<u>2000</u>	-
		7500	26

The five substations to be installed at the locations shown above are required to serve increased loads in those areas and are needed in the near future. The two other substations are required to provide the system with spare substation capacity.

The Evans Construction Company is now doing the work in connection with the transmission lines and distribution substations for the "C" loan and as stated in Stanley's Engineering Report it has agreed to add these additional substations at the same unit price quoted in its existing contract by amending the contract provided that such amendment is approved before August 23, 1951, after which time its prices are no longer firm with its suppliers. It is expected that the cooperative will realize a savings of about \$28,000 by handling the purchase of the additional substations in this manner. The estimated cost of the five additional substations, are complete, including transformers, metering equipment, and regulators. The estimated cost of the two spare substations includes material only.

The 26 miles of 69 kv line proposed in this loan represents construction necessary to tie the additional substations into Corn Belt's generating and transmission system. The following is a construction cost breakdown:

Seven distribution substations	\$340,270
Eight 69 kv Air Break Switches	12,000
Extension at Sherwood plant for inter- connection with Iowa 5 Carroll	52,030
	<u>\$404,300</u>
26 miles 69 kv transmission line	182,700
Total	<u>\$587,000</u>

It is proposed that the Sherwood diesel plant substation extension be handled by contract amendment with the Howard C. Draper Company who now has a contract with Corn Belt for the carrier equipment installation and the Klemme, Galbraith, and Dickens diesel plant substation extensions. Here again, it is believed that a better price can be obtained by amending the existing contract than could be obtained by advertizing for bids on this extension. With prompt approval of this amendment it will be possible for this company to order the Sherwood substation extension along with the three substation extensions already covered by their contract and no delay or increase in price will be involved. The construction cost of this substation extension includes 69 kv metering and land, but does not include transformers.

It is proposed that the eight additional air break switches will be handled by amending the contract with the Graybar Electric Company. This company now has a contract with Corn Belt to supply twelve of the switches. It has agreed to add the additional eight switches at the same unit price applying to the twelve now on order. The cost of these additional switches if added by amendment as proposed will be \$12,000. These switches are required in connection with the installation of this additional substation for proper sectionalizing.

The new allocated load of Corn Belt is 195,367,557 kwh @ ss and 57,300 kw (45% yearly load factor). Since power supply to Glidden (Iowa 5 Carroll) is non-firm or surplus, the allocated demand required to be supplied with firm power from Corn Belt's facilities is only 53,800 kw. Corn Belt's firm generating capacity of 53,105 is considered adequate to supply this allocated load.

APPENDIX I

INVESTMENTS

KILOWATTS

Allocated Data

KW system peak demand	
Including Iowa 5 Carroll	57,300
Excluding Iowa 5 Carroll	53,800
KW Installed Capacity	71,205
Less largest diesel & steam units (1600 kw, 16,500)	18,100
Kw firm generating capacity	53,105

INVESTMENT - THIS REQUEST

TRANSMISSION

<u>LINES</u> - 26 miles, 69 kv	
(1) Labor and material @ \$5500	\$143,000
R/W Clearing @ \$150/mile	3,900
R/W Procurement & legal @ \$400/mile	10,400
Engineering @ 6%	8,800
Overhead	6,600
Contingencies	<u>10,000</u>
	\$182,700

(1) Includes labor to install eight air break switches.

SUBSTATIONS

5 substations, 69/12.5 kv totaling 5500 kva	
Labor and material @ \$45,000 each	\$225,000
Engineering @ 4%	9,000
Land and legal @ \$500 each	2,500
Overhead	3,770
Contingencies	<u>20,000</u>
Total	\$260,270
2 spare substations - 1000 kva each	
Material only	<u>\$ 80,000</u>
Total - Substations	\$340,270

AIR BREAK SWITCHES

Eight switches - material only	\$ 12,000
(labor included in 69 kv line construction)	

SUBSTATION EXTENSION AT SHERWOOD DIESEL PLANT

Labor and material	\$ 45,000
Engineering @ 4%	1,800
Land & Legal	500
Overhead	1,230
Contingencies	<u>3,500</u>
Total	\$ 52,030

APPENDIX I (Cont'd)

Total funds required, this request \$587,000

INVESTMENT RECAPITULATION

GENERATION

Diesel	\$4,387,868
Steam	8,380,000
Total	<u>\$12,767,868</u>

TRANSMISSION

69 kv lines	\$ 4,539,700
Substations & switching facilities	2,272,800
Air Break switches	12,000
Shunt reactors	125,000
Total	<u>\$ 6,949,500</u>

GENERAL PLANT

\$ 711,500

TOTAL INVESTMENT

\$20,428,868

APPENDIX II

YEARLY EXPENSES

<u>KILOWATT HOURS</u>	<u>ALLOCATED DATA</u>
KWH @ SS	195,934,768
KWH net generated (8% over-all transmission line loss)	
Diesel	11,000,000
Steam	<u>201,000,000</u>
Total	212,000,000
KWH gross generated	
Diesel, 4.2% station use	11,500,000
Steam, 6% station use	<u>214,000,000</u>
Total	225,500,000
KWH purchased	-
<u>Generation</u>	
<u>Diesel</u> (same as previous study)	\$453,325
<u>Steam</u>	
Investment	\$8,380,000
KWH net generated	
by gas - 55%	111,000,000
by coal - 45%	<u>90,000,000</u>
Total	201,000,000
Heat Rate - BTU/net KWH	
Gas	14,250
Coal	13,500
Millions BTU gas	1,581,750
Millions BTU coal	1,215,000
Payroll	\$101,000
Maintenance materials & supplies	63,000
Other Operating Supplies & Expenses	13,000
Fuel	
Gas @ 19¢/10 ⁶ BTU	300,500
Coal @ 29.4¢/BTU	357,200
Interest & Amortization @ 4.1%	343,580
Replacement @ .4%	33,520
Taxes & Insurance	57,500
Miscellaneous	<u>10,000</u>
Total - Steam	\$1,279,300
Total yearly generation expenses	\$1,732,625
Generated cost of power, ¢/net kwh	.82

APPENDIX II (Cont'd)

Transmission

Miles of 69 kv line	764	
Substation capacity - kva		
69/12.5	43,750	
steam plant substations	51,000	
Total	94,750	
Investment		
lines	\$4,539,700	
substations	2,272,800	
Shunt reactors	125,000	
Air Break Switches	12,000	
Total	\$6,949,500	
Yearly Expenses		
Operation & maintenance		
69 kv lines @ \$66/mile		\$50,400
Substations		
69/12.5 kv @ 71¢/kva		31,100
steam plant @ 45¢/kva		23,000
Replacement		
69 kv lines @ \$44/mile		33,600
substations @ 24¢/kva		22,700
Interest & Amortization @ 4.1%		284,900
Taxes & Insurance		-
Total yearly transmission expenses		\$445,700

General & Administrative

General Plant Investment	\$711,500
Yearly expenses (see previous study)	\$ 95,530

Summary - Yearly Expenses

Generation	\$1,732,625
Transmission	445,700
General and administrative	95,530
Total	\$2,273,855

Cost of power, ¢/kwh @ ss	1.16
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